

## *Aluta*, a new Australian genus of Myrtaceae

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### Abstract

Rye, B.L. & M.E. Trudgen. *Aluta*, a new Australian genus of Myrtaceae. *Nuytsia* 13 (2): 345–366 (2000). *Aluta* Rye and Trudgen, a genus of five species belonging to the *Chamelaucium* alliance of the Myrtaceae, is described. The new genus occurs in inland regions of Western Australia, the Northern Territory and South Australia. *Aluta* is distinguished from other genera belonging to the *Chamelaucium* alliance by the prominent retrorse gland on its stamens and by the prominently reticulate-pitted disc on its flowers. The relationships of the new genus are discussed, and a key and full descriptions are provided for each of the species and subspecies recognized. Four new combinations based on taxa previously included in the genus *Thryptomene* Endl. are made, viz. *Aluta appressa* (C.R.P. Andrews) Rye & Trudgen, *A. aspera* (E. Pritz.) Rye & Trudgen, *A. maisonneuvei* (F. Muell.) Rye & Trudgen and *A. maisonneuvei* subsp. *auriculata* (F. Muell.) Rye & Trudgen. Lectotypes are chosen for the base names *Thryptomene appressa* C.R.P. Andrews, *T. aspera* E. Pritz. and *T. auriculata* F. Muell. Six of the taxa are illustrated, including the four new taxa *Aluta aspera* subsp. *hesperia* Rye & Trudgen, *A. aspera* subsp. *localis*, *A. quadrata* and *A. teres*.

### Introduction

This paper presents a taxonomic revision of *Aluta* (Myrtaceae), a new genus distributed in western and central Australia. Of the five species referred to *Aluta*, three were originally named under *Thryptomene* Endl. and the other two are new species. There do not appear to be any specific references in the literature to the close relationship between the three previously named species of *Aluta*, and they have never been placed into any infrageneric group or genus of their own.

Prior to Bentham's (1867) treatment of the Australian Myrtaceae, only one species of *Aluta* had been described, as *Thryptomene maisonneuvei*. Two further species, described as *Thryptomene appressa* and *T. aspera*, were known by the time Stapf (1924) placed the species of *Thryptomene* into five sections. Recognizing that *Thryptomene appressa* and *T. maisonneuvei* were not well placed in *Thryptomene*, Stapf excluded them as well as a number of species that are currently placed in either *Micromyrtus* Benth. or *Malleostemon* J.W. Green. While Stapf retained *Thryptomene aspera* in sect. *Thryptomene*, he was clearly doubtful of this placement as *T. aspera* was the only species shown with a question mark.

Green (1983) removed some species from *Thryptomene* to his new genus *Malleostemon*, but not those now considered to belong in *Aluta*. While Green (1980, 1986) made use of some of the unusual features of *T. maisonneuvei* to distinguish it from the other species included in his keys to the arid zone and South Australian species of *Thryptomene*, he otherwise drew little attention to the atypical characteristics of this species.

### Methods

Apart from type material borrowed from MEL, all specimens cited are housed at PERTH, although duplicates may exist in other herbaria. All measurements were taken from dry pressed material. Leaf measurements were obtained from the largest leaves on each specimen. Filament lengths were taken from the longest stamens of each flower and style lengths from very mature flowers and young fruits.

Distribution maps were prepared using distribution data from PERTH herbarium specimens and additional data from Green (1983). The Botanical Provinces used are those defined by Beard (1980). Conservation codes have been assigned according to the Western Australian Department of Conservation and Land Management's system, the categories of which are defined at the end of this *Nytsia* issue.

### Relationships and differentiation of *Aluta*

*Aluta* is one of over 20 genera currently recognized in the *Chamelaucium* alliance in the informal classification of the Myrtaceae devised by Briggs & Johnson (1979). Phylogeny within the alliance is still far from certain, but there appears to be a good basis for separation of this group from other alliances in the family, as discussed by Johnson & Briggs (1985).

Some problems in the delimitation of genera within the *Chamelaucium* alliance have been satisfactorily dealt with in recent years, notably for *Calytrix* and its close relatives (Craven 1987a,b). Among the genera Bentham (1867) included in his very broadly circumscribed concept of *Baeckea* L., some progress has been made by the description of *Ochrosperma* Trudgen (Trudgen 1987) and the reinstatement of *Babingtonia* Lindl. (Bean 1997), *Euryomyrtus* Schauer (Trudgen in press), *Rinzia* Schauer (Trudgen 1986) and *Triplarina* Raf. (Bean 1995). However there are significant problems remaining in the delimitation of genera in the alliance, particularly in the group including *Thryptomene*. These problems and the lack of comparative studies of the morphology and anatomy of other genera within the *Chamelaucium* alliance limit the certainty with which relationships of *Aluta* can be discussed.

In anther morphology, *Aluta* appears to show a closer relationship to *Malleostemon* than to *Thryptomene* and its allies. *Aluta* and *Malleostemon* both have anthers (see Figure 1) with the following characteristics:

1. The grooves of each cell are oblique, not parallel to the connective, and meet towards the apex of the anther. This indicates that the orientation of the two cells is divergent rather than parallel.
2. The adjacent parts of the two cells (i.e. those parts located to the inside of the two grooves) differ in shape from the outer parts, becoming expanded towards the lower end such that they meet and are fused along the length of the anther connective.

3. Pollen dehiscence is by two pores (or very short slits), each located along one of the divergent grooves, closer to the point where the two grooves meet than to the outer edge of the cells.
4. The connective gland is large, with an expanded body directed towards the outside of the flower and tapering towards the connective to a small tip located between the anther cells at the summit of the connective.

In *Aluta* the connective gland is very obvious as it is free except for its attachment at the tapered end to the connective, and the filament joins the connective via a depression located on the outer surface of the anther directly below the gland (Figure 1A). *Malleostemon* differs in having the gland united for its full length to the connective and the distal end of the filament (Figure 1B), forming a structure distinctly broader than the upper part of the free filament. Usually the filament has a fairly sudden bend at the junction of this fused structure and the free portion. This type of stamen is referred to as geniculate (Green 1983).

The geniculate stamen of *Malleostemon* is of the same type as is found in several related groups with multi-loculate ovaries, viz. those Benth. (1867) treated as *Baeckea* sections *Babingtonia* (Lindl.) Benth., *Harmogia* (Schauer) Benth. & J.D. Hook. and *Oxymyrrhine* (Schauer) Benth. & J.D. Hook. All these geniculate groups have the same type of anther as *Aluta* and it is suggested here that *Aluta* represents an evolutionary line that predates the connective gland becoming fused to the filament. If this interpretation is correct, then the separation of *Aluta* or its precursors from the *Babingtonia* lineage is of some antiquity, certainly predating the origin of *Malleostemon*. Like *Aluta*, *Malleostemon* has a 1-celled ovary, but it shows a much greater similarity to the *Babingtonia* lineage in having geniculate stamens, the style in a depression and the flowers often several per peduncle.

Comparison also needs to be made with *Thryptomene* Endl., in which all previously named species of *Aluta* were included, and the genera traditionally considered to be close to *Thryptomene*. These genera have a variety of stamen types, all of which differ from those of *Aluta* and *Malleostemon* in having the connective gland differently attached and with the bulk of the gland directed towards the inside of the flower. Like *Aluta* their stamens are not geniculate, but they often differ in the orientation, fusion or dehiscence of the anther cells. For example, *Thryptomene* has the anther cells free and separated at the base and *Micromyrtus* has dehiscence by long slits reaching the margins of the cells. Members of this group of genera all also differ from *Aluta* in disc ornamentation (see below) and some of them show further differences in ovule number or placentation, inflorescence, hypanthium and sepal characters. Considering all of these characters, each genus shows at least four clear morphological differences from *Aluta*.

Apart from its distinct stamen morphology, *Aluta* can be readily distinguished from other members of the *Chamelaucium* alliance by its very prominently reticulate-pitted disc, which has pits larger than any pits or other pattern units on the hypanthium (Figure 1C,D). Although some members of the other genera have some patterning on the disc, it is never deeply pitted as in *Aluta*, and most of them have much more prominent patterning on the hypanthium than on the disc.

### Taxonomic revision of *Aluta*

*Aluta* Rye & Trudgen, *gen. nov.*

Fruticuli, foliis pusillis oppositis decussatis. Flores axilares solitarii, bracteolis duabus persistentibus subtendis. Sepala 5, in parte herbacea, in fructo persistentia. Petala 5, patentia, sepala multo superantia,

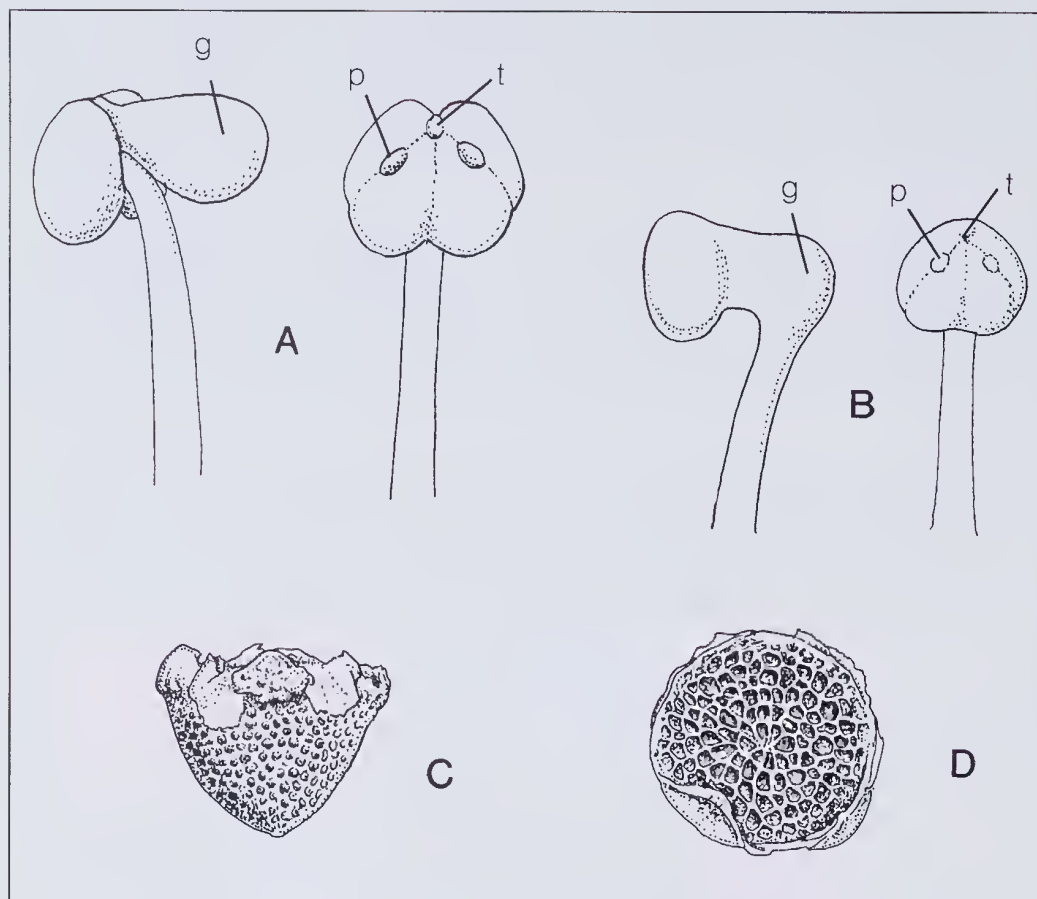


Figure 1. A,B – two views of stamen of *Aluta* (A) and *Malleostemon* (B), the lateral view prior to dehiscence and the inner view after dehiscence, g – gland, p – pore of anther cell through which pollen is released, t – tip of gland, located at apex of connective. C – side view of *Aluta* fruit showing pitted hypanthium. D – top view of *Aluta* fruit showing reticulate-pitted disc.

alba vel rosea, ad basim breviter unguiculata. Stamina 5 sepala opposita, vel c. 10 – c. 20 irregulariter deposita. Antherae bilobatae, uterque lobus dehiscens poro prope centrum sulci qui ex apicem connectivi versus marginem exteriorem lobi; connectivum glande magna clavata ad florem exterium versus. Discus reticulato-foveolatus. Ovarium unicellulare, placenta sub-basalis; ovula in 2 vel 3 paribus oblique superposita. Stylus centralis, nec depressus. Fructus siccus, indehiscens.

*Type: Aluta aspera* (E. Pritz.) Rye & Trudgen.

*Shrubs* small to large; young stems 4-angled. *Leaves* opposite, decussate, small; petiole very short or almost absent; blade thick especially towards apex, often with two distinct lateral surfaces as well as the adaxial and abaxial ones, concolorous, with usually very prominent oil glands particularly on the lateral surfaces. *Inflorescence* of solitary axillary flowers grouped into a subterminal cluster or cylindrical formation on each fertile branchlet, each flower subtended by 2 bracteoles at the summit



of a peduncle, which is shorter than the subtending leaf. *Bracteoles* imbricate and enclosing flower in very young bud, with a thick herbaceous portion from base to apical point and membranous sides, prominently keeled, incurved, persistent; membranous sides broadest at or near base, sometimes somewhat auriculate. *Flowers* actinomorphic, small, protandrous, glabrous throughout except sometimes for the floral tube and sepals. *Hypanthium* adnate to ovary, with no free portion above, usually minutely to fairly prominently pitted or closely wrinkled. *Sepals* 5, more or less herbaceous at the base and sometimes to the apex, the remainder membranous, persistent in fruit; herbaceous portion prominently gland-dotted; membranous portion(s) broad, sometimes auriculate. *Petals* 5, widely spreading, much larger than the sepals, white or pink, shortly clawed at base, broadly rounded at apex. *Stamens* 5, c. 10 or c. 20, if 5 then one opposite each sepal and sometimes alternating with staminodes located opposite the petals, if c. 10 or more then irregularly arranged (with up to 5 opposite the sepals and all or most of the rest alternating with both sepals and petals); filament flattened, tapering from the base to a more slender apex; anther 2-celled, each cell opening by a pore located slightly above the middle of a groove which runs from near the apex of the connective obliquely to the margin of the cell, the connective with a prominent gland directed towards outside of flower; gland clavate, about as large as each anther cell. *Disc* prominently reticulate-pitted, usually horizontal in young fruit and convex in mature fruit. *Ovary* 1-celled, with an oblique sub-basal placenta; ovules in 2 or 3 obliquely superposed pairs, each pair collateral and touching. *Style* central, not sunken, broadest at base; stigma capitate. *Fruit* indehiscent, dry, depressed globular to very broadly ellipsoid, often infertile. *Seed(s)* apparently hard, wedge-shaped or filling available space, smooth and rounded on outer surface, golden brown, glossy.

*Size and distribution.* The genus comprises five species, with subspecies recognized in two of the species, giving a total of eight taxa recognized. *Aluta* is distributed in arid and semi-arid regions of western and central Australia, extending from the upper Gascoyne River in Western Australia east to the Simpson Desert in the Northern Territory and south-east to near Lake Acraman in South Australia. (Figure 2A)

*Etymology.* From the Latin *aluta* – purse or pouch of soft leather, referring to the prominent pouch-like connective gland on the anther.

*Morphology.* As in other members of the *Chamelaucium* alliance, this genus is glabrous but may have minute epidermal outgrowths usually forming denticulate margins. Hair-like structures can develop by extension of these outgrowths into simple or branched slender projections referred to from here on as ‘hairs’. This has occurred in *Aluta aspera* subsp. *aspera*, which has apparently hairy young stems, leaves and bracteoles. Subsp. *aspera* also has a hairy hypanthium.

The leaf-bearing stems of the plants are 4-angled (having four equal surfaces) and may be reddish when actively growing but soon develop a thick whitish bark in strips between the leaf axils on each of their four surfaces. Both the leaves and the strips of whitish bark are shed from the older stems, which have a darker bark and may become deeply longitudinally grooved. The darker bark may appear smooth to the naked eye but is minutely and irregularly rugose, usually with long strips but sometimes with smaller patches.

In most species of *Aluta*, the leaves are distinctly 4-sided in transverse section and their lateral surfaces are often more prominently gland-dotted than the abaxial surface. Only *A. teres* lacks well defined lateral surfaces, but these are often apparent near the apex of the leaf. In *A. teres* most of the leaf is more terete than in other members of the genus, with very prominent glands disrupting the otherwise smooth surface, but the glands are still arranged mainly in two lateral rows.

Both the bracteoles and sepals in *Aluta* are partially membranous, with the remainder somewhat to very herbaceous and usually prominently dotted with oil glands. At first the membranous portion(s) are clear-translucent but they may become whitish and thicker with age. The herbaceous portion of the bracteoles is very thick, keeled and green or partially green. In the sepals the herbaceous portion is usually much less thickened and may become more membranous as the sepals age.

In young fruits the disc is deep pink to dark red. By the time the fruit has fully matured, the stamens and usually also the petals have been shed, but the sepals remain attached. At this stage both the bracteoles and the sepals are quite glossy. The bracteoles are persistent for a while after the fruits are shed. The two bracteoles of each pair usually overlap at the base where the membranous margins are broadest. Retention of the papery sepals in most taxa may result in the fruits being more easily wind-blown, promoting wider dispersal of the seeds.

*Genetic and breeding systems.* Like most other genera of Myrtaceae, *Aluta* probably has a base chromosome number of 11. More chromosome number counts are needed, however, as there is only one record to date for the genus, a tetraploid number of *c.* 22 for *Aluta maisonneuvei*. The plants evidently favour outbreeding, having protandrous flowers that appear to be suited to pollination by small insects.

#### Key to species and subspecies of *Aluta*

1. Flowers 4.5–6(7) mm diameter, with 5(6) stamens opposite the sepals
  2. Stems with firmly attached grey bark. Leaves 3.5–6.5 mm long, with a prominent recurved apical point 1–1.4 mm long. Peduncles 1–3 mm long. (Mt Jackson to Salmon Gums) ..... **A. appressa**
  2. Stems with loose flaky red-brown bark. Leaves 1–2.5 mm long, scarcely pointed. Peduncles up to 0.8 mm long. (Meekatharra to Northern Territory and South Australia) ..... **A. maisonneuvei**
  3. Leaves 1.2–1.6 mm wide; lateral surfaces very oblique (*c.* 45 degrees to almost horizontal), 0.5–0.7 mm wide, with usually 2 rows of prominent oil glands. (Kumarina to Northern Territory and South Australia) ..... subsp. **maisonneuvei**
  3. Leaves 0.7–1.2 mm wide; lateral surfaces somewhat oblique (less than 45 degrees) to vertical, usually 0.3–0.4 mm wide and with 1 row of prominent oil glands. (Meekatharra to South Australia) ..... subsp. **auriculata**
1. Flowers 7–12 mm diameter, with *c.* 10 or more stamens, usually irregularly arranged, always with some alternate to the sepals and petals
  4. Leaves 15–20 mm long, with an erect to incurved apical point. Outer sepals distinctly auriculate. Stamens 15–22. (Eastern Pilbara) ..... **A. quadrata**
  4. Leaves 1.5–13 mm long, with apical point recurved or very reduced to absent. Sepals not or scarcely auriculate. Stamens *c.* 10
    5. Leaves more or less terete, with a prominent recurved apical point. Bracteoles ovate, with a recurved apical point. (Sandstone area) ..... **A. teres**
    5. Leaves 4-angled in cross-section, scarcely pointed. Bracteoles broadly ovate or with a very broad base and linear apex, acute. (Gascoyne River to Wongan Hills and Kalgoorlie area) ..... **A. aspera**
  6. Leaves with both simple and branched hairs 0.2–0.4 mm long. Sepals ciliolate. Fruit with a densely hairy hypanthium. (Bungabin Hill to Yindi Station) ..... subsp. **aspera**

6. Leaves glabrous or with simple hairs less than 0.1 mm long restricted to the 4 angles of the blade. Sepals entire. Fruit glabrous
7. Leaves 4–13 mm long, finely denticulate to ciliate along the angles. Bracteoles 3–5 mm long. (Gabbin to Mukinbudin) ..... subsp. **localis**
7. Leaves 1.5–4.5(5.5) mm long, coarsely denticulate or smooth on the angles. Bracteoles 1.3–3 mm long. (Upper Gascoyne River to Wongan Hills to Sandstone) ..... subsp. **hesperia**

*Aluta appressa* (C.R.P. Andrews) Rye & Trudgen, *comb. nov.*

*Thryptomene appressa* C.R.P. Andrews (Andrews 1904: 41). *Type*: north of Esperance, Western Australia, October 1903, C.R.P. Andrews 1275 (*lecto*: PERTH 01620959; *isolecto*: PERTH 01620940).

*Shrubs* usually 0.7–2 m high, sometimes many-branched near base, up to at least 1.2 m wide, glabrous; leaf-bearing branchlets mostly arising at angles of 10–20 degrees, long and slender, 4-ridged; leaves mostly separated by internodes about as long as the leaves but often more crowded towards ends of branchlets, mostly antrorse to appressed, but those subtending flowers sometimes almost patent; older stems developing a dark grey bark with strips mostly firmly attached. *Petioles* up to 1 mm long. *Leaf blades* more or less narrowly oblong-elliptic in outline, 3.5–6.5 x 1–1.2 mm not including point, 4-angled, with a flat abaxial surface broader than the oblique lateral surfaces, the adaxial surface fairly flat but recurved at apex; apical point 1–1.4 mm long, but upper part often broken off in older leaves; glands not always obvious, mostly in 2 rows on each lateral surface and less clear on abaxial surface, up to 0.1 mm diameter. *Inflorescence* with rarely fewer than 5 pairs of flowers and up to c. 20 pairs in a cylindrical formation on each branchlet; peduncles 1–3 mm long. *Bracteoles* ovate or broadly ovate, 1.4–2 mm long, acute and with a minute to prominent apical point; membranous margins 0.2–0.5 mm wide, entire. *Flowers* 4.5–6(7) mm diameter; disc yellow at first, turning deep red. *Sepals* depressed ovate to semicircular, 0.5–0.8 mm long not including auricles; herbaceous portion almost reaching apex, often reddish; auricles usually evident on outermost sepals, extending up to 0.2 mm below base of sepal. *Petals* almost circular, 2–3 mm long, white or pink, entire, slightly crenulate. *Stamens* 5, opposite the sepals, alternating with very reduced staminodes; filament 0.5–0.6 mm long, reddish; anther 0.3–0.4 mm wide, red-brown; gland yellow at first, turning reddish. *Staminodes* 1–3 (most commonly 1) opposite the petals, point-like, c. 0.1 mm long. *Ovules* 4. *Style* 0.5–0.7 mm long. *Fruit* 1.2–1.5 mm long, apparently 4-seeded; hypanthium with a fairly prominent ornamentation of close wrinkles or a fine reticulum enclosing small pits; disc 1.3–1.6 mm diameter. *Seeds* not seen at maturity, wedge-shaped, the inner surfaces somewhat rough and indented, 0.8–1.2 mm long. (Figure 3A–C)

*Selected specimens examined.* WESTERN AUSTRALIA: 280 mile peg, Great Eastern Highway [c. 49 km E of Yellowdine], 11 Sep. 1962, T.E.H. Aplin 1959; Rollonds Rd, Cascade, 4 July 1994, R. Bruhn 6/4794; 10.5 km WSW of Salmon Gums, 2 Oct. 1983, M.A. Burgman & S. McNee 2592; c. 35 km WSW of Coolgardie, 5 Sep. 1973, N.N. Donner 4554 (ex AD); South Ironcap, 11 Nov. 1978, J.W. Green 4899; Frank Hann National Park, 2 Aug. 1978, D. Monk 068; 2 miles [3 km] N of Daniell, 11 Sep. 1966, K.R. Newbey 2569.

*Distribution.* Distributed in the inland part of the South West Botanical Province and in the South-western Interzone of Western Australia, extending from near Mt Jackson south-east to near Salmon Gums. (Figure 2B)



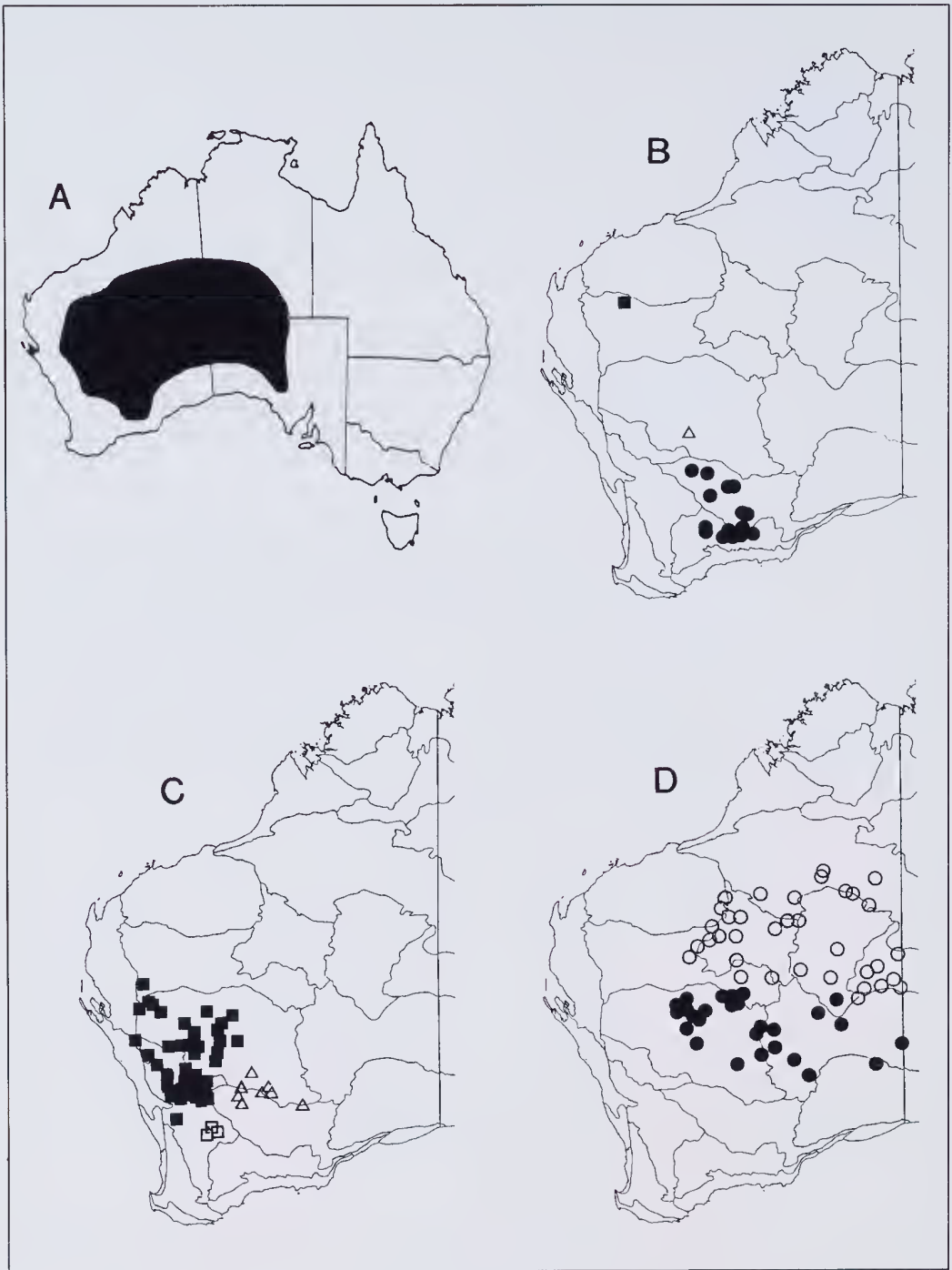


Figure 2. Geographic distribution of *Aluta*. A – whole genus; B – *Aluta appressa* ●, *A. quadrata* ■ and *A. teres* △ ; C – *Aluta aspera* subsp. *aspera* △ , *A. aspera* subsp. *localis* □ and *A. aspera* subsp. *hesperia* ■ ; D – *Aluta maisonneuvei* subsp. *auriculata* ● and subsp. *maisonneuvei* ○ in Western Australia.



*Habitat.* Recorded from yellow sand or from yellow-brown clayey sand and/or gravel or laterite, with the north-easternmost record from an ironstone ridge. Occurs in low to tall shrublands, sometimes dominated by *Casuarina*, *Melaleuca* or mallee *Eucalyptus* species.

*Phenology.* Flowers recorded from early July to September. Only two specimens are in mature fruit, one in October and one in November.

*Conservation status.* Not considered to be at risk at present.

*Typification.* Of the two type specimens at PERTH, the one chosen as lectotype has an attached label indicating that it was part of Cecil Andrews' herbarium, while the other one was evidently a duplicate that was previously part of C.A. Gardner's private herbarium.

*Notes.* Like *Aluta maisonneuvei*, this species has five stamens, each directly opposite the centre of a sepal, and minute staminodes (when present) opposite the centre of each petal. Other members of the genus have at least nine stamens, usually in an irregular arrangement, with up to five of the stamens opposite the sepals but with most of the stamens alternating with both the sepals and petals. *A. maisonneuvei* can be readily distinguished from *A. appressa* by the characters used in the key and also by its almost sessile leaves.

***Aluta aspera* (E. Pritz.) Rye & Trudgen, *comb. nov.***

*Thryptomene aspera* E. Pritz. (Diels & Pritzel 1904: 35, Figure 49F–M). *Type:* Comet Vale, 25 km south of Menzies, Western Australia, 28 October 1901, *L. Diels* 5163 (*lecto:* PERTH (ex B) 01620975, here selected; *isolecto:* B, destroyed).

*Shrubs* 0.2–3 m high; leaf-bearing branchlets 4-ridged; older stems developing a medium or dark grey bark with strips mostly firmly attached. *Leafblades* 4-angled, with oblique lateral surfaces as broad as or broader than the usually concave adaxial surface, mucronate or lacking an apical point; oil glands in 1 or 2 rows on each lateral surface, usually prominent, up to 0.2 mm diameter. *Bracteoles* broadly ovate or with a very broad base and distal half leaf-like; membranous margins broad at base but not reaching apex. *Sepals* more or less broadly elliptic or depressed ovate and sometimes emarginate; herbaceous portion ovate to narrowly oblong, reaching apex sometimes but often broadly bordered around apex, often green at centre and with reddish margins, becoming more membranous and fading to orange in fruit, the oil glands very prominent; membranous margins not or scarcely auriculate. *Flowers* 7–12 mm diameter; disc becoming deep pink. *Petals* broadly obovate. *Stamens* usually 10, sometimes 9; anther 0.25–0.4 mm wide, reddish to almost black; gland usually translucent and somewhat yellowish at first, becoming darker and probably pinkish. *Staminodes* often a few present in the larger gaps between stamens but very reduced, tooth-like or point-like, less than 0.1 mm long. *Fruit* 1.2–2 mm long; hypanthium with a fairly prominent ornamentation of wrinkles or a reticulum enclosing small to large pits, sometimes hidden by hairs; disc 1.5–2.5 mm diameter. *Seeds* not seen at maturity.

*Distribution.* Occurs in Western Australia, extending from near the upper Gascoyne River south to Wongan Hills and south-east to near Yindi Station.

*Typification.* Two specimens were cited in the protologue; portions removed from B (Berlin) specimens of both of these former syntypes were donated to PERTH prior to the destruction of the Berlin material

during the second World War. The larger of these PERTH specimens is chosen here as the lectotype. The rejected syntype was: near Menzies, October 1901, *E. Pritzel* 841 (PERTH (ex B) 01620975).

*Notes.* A polymorphic taxon whose three main variants are treated here as subspecies, all appearing from the available records to be allopatric. The differences between these subspecies appear to be significant but are certainly smaller than those differentiating the five species of *Aluta* currently recognized. There is ample material of two of the subspecies but very little of the third, which is therefore of less certain status.

**a. *Aluta aspera* (E. Pritz.) Rye & Trudgen subsp. *aspera***

*Illustration.* Diels & Pritzel (1904: Figure 49F–M).

*Shrubs* 0.2–1.1 m high, usually rather dense, sparsely to moderately densely ‘hairy’ on young stems, leaves and bracteoles; leaf-bearing branchlets arising mostly at angles of 30–60 degrees, usually short; leaves usually crowded on end of branchlets; ‘hairs’ simple or branched, patent, 0.2–0.4 mm long, coarse. *Petioles* up to 0.7 mm long. *Leaf blades* narrowly oblong or narrowly obovate to obovate in outline, 3–5.5 x 0.8–1.4 mm. *Inflorescence* usually with 1–5 pairs of flowers densely clustered, but occasionally with up to 7 widely spaced pairs of flowers per group; peduncles 0.5–1.5 mm long. *Bracteoles* 2–3 mm long; membranous margins 0.3–0.8 mm wide, minutely ciliate-denticulate. *Flowers* 9–12 mm diameter. *Sepals* 1–2 mm long, minutely ciliate, sometimes also with a few hairs on outer surface. *Petals* 3.5–5.5 mm long, white, denticulate. *Stamens*: filament 1.3–2 mm long. *Style* 0.9–1.2 mm long. *Fruit* with hypanthium densely covered by curved or curly hairs. (Figure 3D)

*Selected specimens examined.* WESTERN AUSTRALIA: 2 miles [3 km] W of Musson’s Soak, 10 Sep. 1970, *J.S. Beard* 6256; 17 km SE of Johnson Rocks, Walling Rock Station, 15 Sep. 1988, *R.J. Cranfield* 7476; 5 km N of Comet Vale, 5 July 1995, *R.J. Cranfield* 9849; 1 mile [1.6 km] N of Comet Vale, 17 Sep. 1927, *C.A. Gardner* 1927; c. 1.6 km SW of North West Peak, Mt Manning Range, 4 Nov. 1995, *N. Gibson & B. Moyle* 3260; 64.5 km by road E of Comet Vale and 2.2 km E of the grid at eastern boundary of Goongarrie National Park, 24 Apr. 1991, *T.D. Macfarlane* 1897; 15 km NE of Bungalbin Hill, 1 Dec. 1981, *K.R. Newbey* 9432; 10 miles [16 km] SW of Yindi, 11 Oct. 1974, *E. Wittwer* 1368.

*Distribution.* Occurs in the South-western Interzone, extending from between Johnson Rocks and Bungalbin Hill east to near Yindi Station. (Figure 2C)

*Habitat.* Recorded from sand or sandy clay, the soil often yellow but sometimes brown or red, sometimes with laterite and one record from granite. The vegetation may be dominated by mallees (*Eucalyptus*) or by *Banksia*.

*Phenology.* Flowers: July to November. Fruits: October to December.

*Conservation status.* Probably not at risk at present.

*Notes.* This is the only ‘hairy’ member of the genus (see morphology section above). It usually has longer stamens than the other two subspecies of *A. aspera*, and occurs well inland in the south-eastern part of the species range. Unlike the other two subspecies, subsp. *aspera* appears always to have white flowers.

**b. *Aluta aspera* subsp. *hesperia* Rye & Trudgen, subsp. nov.**

Ab aliis subspeciebus floribus minoribus et foliis integris vel grosse dentatis recedit.

*Typus*: near east bank of Lake Moore, c. 51 km north of Cleary, Western Australia, 2 September 1967, P.G. Wilson 6124 (*holo*: PERTH 02186500; *iso*: CANB, K, MEL).

*Shrubs* 0.4–3 m high, often widely spreading, glabrous; leaf-bearing branchlets arising mostly at angles of 25–50 degrees, usually long and slender; leaves usually not very crowded. *Petioles* up to 0.8 mm long. *Leafblades* narrowly to broadly obovate in outline, 1.5–4.5(5.5) x 0.7–2.3 mm, entire or coarsely denticulate. *Inflorescence* of usually 1–4 pairs of flowers in a tight cluster but sometimes up to 8 pairs in a cylindrical arrangement; peduncles 0.4–1.5 mm long. *Bracteoles* 1.3–3 mm long; membranous margins 0.3–0.8 mm wide, entire. *Flowers* 7–10(11) mm diameter. *Sepals* 1–2.5 mm long; herbaceous portion ovate to narrowly oblong, reaching apex sometimes but often broadly bordered around apex; membranous margin(s) entire. *Petals* 2.5–4(5) mm long, white or pink, usually entire or somewhat crenulate, rarely denticulate. *Stamens*: filament 0.7–1.4 mm long, white to deep pink. *Style* 0.8–1.3 mm long. *Fruit* glabrous. (Figure 3E–I)

*Selected specimens examined*. WESTERN AUSTRALIA: Dairy Creek Station, 21 Aug. 1965, J.S. Beard 4358; Byro Station, c. 28 km NW of the Mullewa–Gascoyne Junction road on road to Woodleigh Station, 12 Sep. 1985, B.J. Conn 2082 (ex NSW); 1.5 km S of Jingermarra Homestead, 27 June 1985, R.J. Cranfield 5250; Weld Range, 21 July 1966, A.R. Fairall 1837; Mount Magnet, 12 July 1931, C.A. Gardner 2247; 20 km WNW of Youangarra, Paynes Find–Sandstone road, 24 June 1995, S. Patrick 2289; Wongan Hills, P. Roberts 205; 14 miles [23 km] W of Sandstone, 17 Oct. 1972, R.D. Royce 10478; 1 mile [1.6 km] S of Caron, 15 Oct. 1972, C.I. Stacey 215; 37.3 km N of Wubin on Great Northern Highway, 30 Aug. 1975, M.E. Trudgen 1418; Talling Peak, 14 Sep. 1978, M.E. Trudgen 2227.

*Distribution*. Occurs in the Ereman and South West Botanical Provinces, extending from Dairy Creek Station (near the upper Gascoyne River) south to Wongan Hills and south-east to near Sandstone. (Figure 2C)

*Habitat*. Recorded from sand or sandy clay, the soil often yellow but sometimes brown or red, sometimes on breakaways or other rocky sites. The associated vegetation commonly includes *Acacia* as one of the dominants, often also *Casuarina* and *Eucalyptus*.

*Phenology*. Flowers: March to October, especially May to September. Fruits: recorded August to November.

*Conservation status*. A widespread taxon not considered to be at risk.

*Etymology*. From the Latin *hesperia* – western, referring to the distribution of this subspecies, which extends further west than any other member of the genus *Aluta*.

*Notes*. This variant has a much larger distribution than the other two subspecies but apparently does not overlap with either of them, occupying the northern and western parts of the species distribution. It usually has smaller flowers than the other subspecies but there are occasional large-flowered



Figure 3. A–C. *Aluta appressa*. A – flowering branch (x1), B – portion of flowering stem (x4), C – top view of flower (x6); D – *Aluta aspera* subsp. *aspera*, portion of stem and pair of leaves (x7.5); E–I. *Aluta aspera* subsp. *hesperia*. E – flowering branch (x1), F – portion of stem with paired leaves (x5), G – bracteoles (x5), H – top view of flower (x4), I – disc and sepals in fruit (x5); J–L. *Aluta aspera* subsp. *localis*. J – flowering branch (x1), K – portion of flowering stem (x3), L – top view of flower (x4). Drawn from K.R. Newbey 5629 (A,B), J.S. Beard 4751 (C), R.J. Cranfield 9849 (D), S. Patrick 2268 (E–H), R.J. Cranfield 6203 (I) and N. & P. Moyle s.n. (J–L).



specimens. It has been known as *Thryptomene aspera* subsp. *glabra* J.W. Green ms. and also by the phrase name *Thryptomene aspera* subsp. Paynes Find (C.A. Gardner 11996).

**c. *Aluta aspera* subsp. *localis* Rye & Trudgen, *subsp. nov.***

A subspecie typica foliis glabris vel minus pilosis et sepalis integris recedit.

*Typus*: Mukinbudin, Western Australia, 21 October 1991, T. Squire 2 (*holo*: PERTH 02159449; *iso*: CANB.)

*Shrubs* height not recorded, glabrous except for the leaf blades; leaf-bearing branchlets arising mostly at angles of 15–30 degrees, long and slender. *Petioles* up to 1.3 mm long. *Leaf blades* linear to narrowly obovate or narrowly ovate in outline, 4–13 x 0.9–1.3 mm, with the 4 longitudinal ridges of the leaf finely denticulate to shortly ciliate, the cilia less than 0.1 mm long. *Inflorescence* with usually 4–8 pairs of flowers per group; peduncles 0.5–1.5 mm long. *Bracteoles* 3–5 mm long; membranous margins sometimes only in basal half of bracteole, 0.8–1.0 mm wide, entire. *Flowers* 9–12 mm diameter. *Sepals* 1.5–2 mm long, entire. *Petals* 3.5–5.5 mm long, pale pink (based on single record), denticulate. *Stamens*: filament 0.8–1.3 mm long. *Style* c. 0.6 mm long. *Fruit* glabrous. (Figure 3J–L)

*Specimens examined*. WESTERN AUSTRALIA: N of Mukinbudin [precise locality withheld], 6 Nov. 1988, N. & P. Moyle s.n.; 'N.' [N of] Korrelocking, 24 Nov. 1959; S.B. Rosier 247; N of Gabbin, 27 Oct. 1963; S.B. Rosier 368.

*Distribution*. Occurs in the South West Botanical Province, recorded from north of Gabbin south to near Korrelocking and east to Mukinbudin. (Figure 2C)

*Habitat*. One of the Mukinbudin specimens is recorded from sandplain. No other habitat details are known.

*Phenology*. Flowers and fruits: October to November.

*Conservation status*. CALM Conservation Codes for Western Australian Flora: Priority One. Recorded from three or four localities in the wheatbelt.

*Etymology*. From the Latin *localis* – local, referring to the localized occurrence of the few known populations of this subspecies.

*Notes*. This variant has been known by the phrase names *Thryptomene aspera* subsp. Mukinbudin (N. & P. Moyle s.n.) and *Thryptomene aspera* subsp. Gabbin (S.B. Rosier 368), the former tending to have longer leaves than the latter but no significant differences.

This subspecies occurs south-west of the range of subsp. *aspera* and south-east of the range of subsp. *hesperia*. It is intermediate between the other two subspecies in leaf indumentum and perhaps in floral morphology, having the large flowers typical of subsp. *aspera* combined with the short stamens typical of subsp. *hesperia*, but tends to have longer leaves and bracteoles than both of them. The specimens of subsp. *localis* with the larger leaves and flowers are not in fruit, so the fruiting measurements given above apply only to the smaller specimens. Even so, this subspecies apparently tends to have shorter styles than the other two subspecies.

***Aluta maisonneuvei*** (F. Muell.) Rye & Trudgen, *comb. nov.*

*Thryptomene maisonneuvei* F. Muell. (Mueller 1864: 64–65). *Type:* Finke River, central Australia [Northern Territory], J.M. Stuart (*holo:* MEL 70712).

*Shrubs* 0.3–1.5(1.8) m high, often widely spreading, up to 2.5 m wide, glabrous; leaf-bearing branchlets mostly arising at angles of 30–60 degrees, somewhat indented on the 4 angles; leaves fairly crowded on the branchlets, almost appressed to patent but usually widely antrorse; older stems developing flaky deep red-brown bark with loose strips readily shed. *Petioles* less than 0.2 mm long. *Leaf blades* narrowly obovate to depressed elliptic in outline, 1–2.5 x 0.7–1.6 mm, 4-angled and prominently 4-ridged, with a flat abaxial surface broader than the oblique or perpendicular lateral surfaces, the abaxial surface often somewhat concave, the ridges smooth to coarsely denticulate, scarcely pointed at apex; glands usually 2–6 prominent ones in 1 or 2 rows (sometimes more when in 2 rows) on each lateral surface, usually few or no prominent glands elsewhere, up to 0.1 mm diameter. Inflorescence with 1–3(5) pairs of flowers in an almost terminal cluster or rarely in more than one cluster per branchlet; peduncles up to 0.8 mm long but often very reduced. *Bracteoles* very broadly ovate, 1–1.8 mm long, acute and with a minute to prominent apical point; membranous margins 0.2–0.4 mm wide, minutely denticulate or entire. *Flowers* 4.5–6 mm diameter; disc pink or red. *Sepals* broadly to depressed ovate, 0.5–1.3 mm long not including auricles; vegetative portion reaching or almost reaching apex, ovate or narrowly ovate, keeled and incurved at apex, often reddish; auricles usually prominent, extending laterally and usually also somewhat to far below the base of the sepal, up to 0.6 mm below base of sepal, denticulate. *Petals* almost circular, 1.7–2.5 mm long, white or pink, denticulate. *Stamens* 5(6), opposite the sepals, sometimes alternating with staminodes; filament 0.5–1 mm long, pink to red; anther c. 0.3 mm wide; gland often reddish. *Staminodes* usually less than 0.1 mm long but prominent and up to c. 0.8 mm long in some specimens. *Ovules* 4. *Style* 0.5–1 mm long. *Fruit* depressed globular to broadly ellipsoid with an almost truncate to strongly convex apex, 1.5–2 mm long, very rarely fertile, when fertile 1-seeded; disc 1.8–2.3 mm diameter. *Seed* aligned across the fruit, probably somewhat reniform and c. 1.1 mm long.

*Distribution.* Distributed from Meekatharra in the Ereman Botanical Province of Western Australia east to Simpson Desert in Northern Territory and south-east to near Lake Acraman in South Australia (Green 1980: Map 1). See also Figure 4.

*Habitat.* Through most of its range *Aluta maisonneuvei* occurs commonly with spinifex on red sand dunes (both on and between the ridges) and sandplains, and is often the dominant species in open shrublands, although sometimes the dominant species are mallees or other *Eucalyptus* species or occasionally other genera such as *Casuarina* and *Acacia*. However from Meekatharra east to Wongawol Station, most specimens are from high rocky sites, e.g. the tops of breakaways, and the soil is sometimes yellow and/or clayey.

*Chromosome number.*  $2n = c. 22$  (Rye 1979). The single chromosome number record is from subsp. *auriculata*. The voucher specimen (B.L. Powell 73097) was collected from Lorna Glen Station, with no habitat recorded. Judging by its location and the shape of its leaves, however, this specimen appears to be a representative of the 'breakaways' variant of the species that occurs on an atypical high rocky habitat.

*Conservation status.* Both subspecies have abundant populations over a wide distribution.

*Phenology.* Flowers mainly recorded April to October, but probably occurring at any month of the year provided there has been sufficient rainfall to stimulate flowering. Fruiting quickly follows, but seed set is very poor. In a sample of 100 fruits of *A. maisonneuvei* ordered from a seed company, only eight contained a seed (Rye & James 1992), the average seed length in this sample being 1.1 mm and the average seed weight 0.41 mgm. No mature seeds were found in fruits sampled from the herbarium specimens examined in the present study, and Green (1980) also failed to locate mature seeds.

*Notes.* This species differs from all other members of the genus in its very loose flaky red-brown bark and its indented rather than 4-ridged branchlets having each of the internodes on the four surfaces distinctly swollen. It is possibly the only member of the genus to have only one seed per fruit, but seed characters are too poorly known in this genus to draw any definite conclusions.

Not surprisingly in a species with such a wide distribution, there is great variation in vegetative, floral and fruiting characters. For example, the sepal auricles show enormous variation, occasionally being so large that they are about as long as the body of the sepals, but at the other extreme being level with the base of the sepal body (i.e. not extended at all below it). Nearly all flowers have 5 stamens, but very rare 6-staminate flowers have been observed, with two stamens borne opposite one of the sepals.

Other morphological variation within the species is discussed under the two subspecies, which are distinguished primarily by leaf characters.

**a. *Aluta maisonneuvei* (F. Muell.) Rye & Trudgen subsp. *maisonneuvei***

*Illustration.* Green (1980: Figures 1–11).

*Leaf blades* mostly broadly obovate to almost circular in outline, sometimes obovate or depressed elliptic, 1–2.5 x 1.2–1.6 mm; lateral surfaces very oblique, at c. 45 degrees or more to the perpendicular (i.e. usually closer to horizontal than perpendicular), 0.5–0.7 mm wide, with prominent glands usually in 2 rows. *Fruit:* hypanthium usually with a reticulate pattern of ridges surrounding small to large pits, each pit with a central oil gland, rarely with the surface more closely wrinkled and scarcely pitted.

*Selected specimens examined* (typical variant). WESTERN AUSTRALIA: 16 km N of Kumarina, 31 Oct. 1978, *H. Demarz* 6974; E of Savory Creek, 13 June 1984, *G.J. Morse* 141 (ex CBG); Blackstone Ranges, Wingelina nickel mines, 8 Jan. 1973, *D.E. Symon* 8381 (ex ADW); 5.5 km WSW of Cooma Well, 23.8 km WNW of Moffettah Well, 8 Aug. 1991, *S. van Leeuwin* 934; Rudall, 23 May 1983, *K. Walker* 274.

NORTHERN TERRITORY: 22 miles [35 km] S of Henbury Homestead, 5 Aug. 1954, *G. Chippendale* 145 (ex NT); NW Simpson Desert, 24° 42'S, 135° 52'E, 25 Aug. 1977, *P.K. Latz* 7439; Lake Neale, 28 Aug. 1973, *J.R. Maconochie* 1881 (ex NT).

*Selected specimens examined* (atypical variant). WESTERN AUSTRALIA: 51.2 miles [82.4 km] from Carnegie Station on way to Mt Everard, 27 July 1966, *A.R. Fairall* 2010; between Blackstone and Cavanagh Ranges, 22 July 1963, *A.S. George* 5266.

NORTHERN TERRITORY: 2 miles [3 km] SSE of Santa Teresa Mission, 18 Aug. 1956, *M. Lazarides* 5739 (ex CANB); 100 km W on Lasseter Highway to Ayers Rock, 29 Oct. 1989 *B. Nordenstam & A. Anderberg* 924 (ex S).

SOUTH AUSTRALIA: Birksgate Range, May 1969, *J.R. Ford*; Mt Davies road, c. 80 km W of Musgrave Park Station, 30 Oct. 1966, *J.Z. Weber* 208 (ex AD).



*Distribution.* Distributed from Kumarina in the Ereman Botanical Province of Western Australia east to Simpson Desert in Northern Territory and extending into northern South Australia. (Figures 2D, 4)

*Notes.* Subsp. *maisonneuvei* is distinguished from subsp. *auriculata* by its leaves with very obliquely angled lateral surfaces, each usually with two rows of prominent oil glands. Subsp. *auriculata* usually has narrower leaves, with the lateral surfaces narrower and moderately oblique to almost perpendicular and with the prominent oil glands mainly located in a single row.

The second most important difference between the two subspecies is that the fruit usually has much more prominent gaps or pitting on the floral tube ornamentation in subsp. *maisonneuvei* than in subsp. *auriculata*, the latter having a more uniformly wrinkled appearance to the floral tube. Sepal shape varies greatly in both subspecies but there appears to be some tendency for subsp. *auriculata* to have more obtuse sepals than the typical subspecies.

Within subsp. *maisonneuvei* there is considerable variation in the size of the pits on the hypanthium, a character which correlates fairly well with the width and degree of obliqueness of the lateral surfaces of the leaf. Plants from the north-western part of the subspecies range, including a majority of the Western Australian specimens, tend to have both the largest pits and the broadest and most oblique (closest to horizontal) lateral leaf surfaces. Many of the Northern Territory specimens, including the type, also have relatively large pitting on the hypanthium and broad lateral surfaces on the leaf. A second variant with less obvious pitting on the hypanthium, and sometimes also narrower lateral leaf surfaces, occurs in central Australia, overlapping with the range of the typical variant. Figure 4 shows the known distributions of the typical and atypical variants of the subspecies, the former with pits usually nearly as large and obvious as those on the disc, the latter with pits much finer than those of the disc or scarcely evident.

**b. *Aluta maisonneuvei* subsp. *auriculata* (F. Muell.) Rye & Trudgen, *comb. nov.***

*Thryptomene auriculata* F. Muell. (Mueller 1876: 24). *Type:* between Youldeh [Ooldea] and Ouldabinna [east of Lake Dey-Dey], [South Australia], 13 July 1875, *Young* (*lecto:* MEL 70713, here designated).

*Illustration.* Green (1986: Figure 485D).

*Leaf blades* narrowly obovate to broadly ovate in outline but mostly more or less obovate, 1.3–2.3 x 0.7–1.2 mm; lateral surfaces somewhat oblique or perpendicular, if oblique then deviating by less than c. 30 degrees from the perpendicular, 0.3–0.4(0.45) mm wide; prominent glands in 1 row on each lateral surface. *Fruit:* hypanthium either closely wrinkled or relatively smooth and glossy, gaps or pits between the wrinkles either very small or absent.

*Selected specimens examined* (typical variant). WESTERN AUSTRALIA: 11 miles [18 km] E of Eeldoun, 18 Aug. 1960, A.R. Main; between Tjidichurra Waterhole and South Australian border on Connie Sue Highway, 26 Aug. 1980, D.E. Symon 12666 (ex ADW).

SOUTH AUSTRALIA: Serpentine Lakes, 34 km N of Vokes Hill road junction, 7 Aug. 1979, V. Levitske 204 (ex AD) Serpentine Lakes (unnamed conservation park), 14.7 km E of the Western Australian border on the Vokes Hill track, 31 July 1979, L.D. Williams 10722 (ex AD).

*Selected specimens examined* (atypical variant on sand). WESTERN AUSTRALIA: De La Poer Range Nature Reserve, 18 Oct. 1996, A. Chapman *et al.* DLP 13; c. 35 km W of Plumridge Lakes, 8 km WNW



of Salt Creek airstrip, 15 Sep. 1979, *M.D. Crisp* 5821, *J. Taylor & R. Jackson* (ex CBG); 23 miles [37 km] NE of Cosmo Newberry, 24 Aug. 1961, *A.S. George* 2874; 14 miles [23 km] SE of Murchison Downs, 28 Aug. 1958, *N.H. Speck* 1311 (ex CANB).

*Selected specimens examined* (atypical variant on breakaways). WESTERN AUSTRALIA: c. 49 km NE of Meekatharra on road to Wiluna, 6 Sep. 1985, *B.J. Conn* 1987 (ex NSW); 1.7 km E of Andrews Bore, Yoothapina Station, 12 Aug. 1986, *R.J. Cranfield* 5662; 7 km from Wongawol Homestead on the Wiluna road, 7 Sep. 1982, *L.A. Craven* 7518 (ex CANB); top of breakaway 7.9 km E of Coglad Downs Station on road to Sandstone, 22 June 1995, *S. Patrick* 2279.

*Distribution.* Distributed from Meekatharra in the Ereman Botanical Province of Western Australia east to the Serpentine Lakes area of South Australia and extending south-east in South Australia at least to the Ooldea area. (Figures 2D, 4)

*Typification.* The lectotype chosen here comprises two mounted branches and the sheet has a note attached stating “*Thryptomene auriculata* appears to be a form of *T. maisonneuvei*”, apparently in Mueller’s handwriting. There is also material from at least one other collection in a packet attached to the lectotype’s sheet; this contains fragmentary pieces of more than one species, including some of *Aluta maisonneuvei* that may have been one of the syntypes (now excluded) cited by Mueller.

*Notes.* Black (1926) included *Thryptomene auriculata* as a synonym of *T. maisonneuvei* and this was followed by subsequent authors such as Green (1983). While *T. auriculata* does not appear to be sufficiently distinct to reinstate as a species, it does show differences that appear to be significant enough to justify the subspecific rank assigned to it here. Apart from the morphological differences outlined in the key and in the notes under subsp. *maisonneuvei*, the two subspecies are largely, or perhaps fully, geographically separated as is evident from the distribution maps (Figures 2D, 4).

The lectotype of *Aluta maisonneuvei* subsp. *auriculata* has a relatively smooth glossy hypanthium, matching several other specimens examined from South Australia and also two specimens from the Great Victoria Desert in the south-east of Western Australia. A second variant appears from the available records to be allopatric, occurring further west in Western Australia from the Meekatharra area to the Plumbridge Lakes area. It has a more patterned dull hypanthium than the typical variant, its fruiting hypanthium being intricately wrinkled-tuberculate, with no distinct pits or with very small pits between the wrinkles. Most specimens of this variant apparently occur, like all other variants of *Aluta maisonneuvei*, on sand dune or sandplain habitats, but at least nine specimens are known from elevated rocky habitats such as breakaways. This ‘breakaways subvariant’ tends to be a slightly smaller plant (0.3 to 1.2 m high) than all other variants of both subspecies (mostly 0.5 to 1.5 m high) and to have narrower leaves. It has predominantly narrowly obovate or obovate leaves whereas specimens of subsp. *auriculata* occurring in sandy habitats more commonly have obovate to broadly ovate leaves. The breakaways subvariant occurs in the far west of the subspecies range, extending from Meekatharra south to Coglad Downs Station and east to Wongawol Station, but overlaps in distribution with the ‘sand subvariant’. See Figure 4 for an illustration of the distributions of these variants.

***Aluta quadrata*** Rye & Trudgen, *sp. nov.*

Ab aliis speciebus foliis 4-porcatis in sectione transversali quadratis, staminum circa 15, ovulis circa 6 differt.

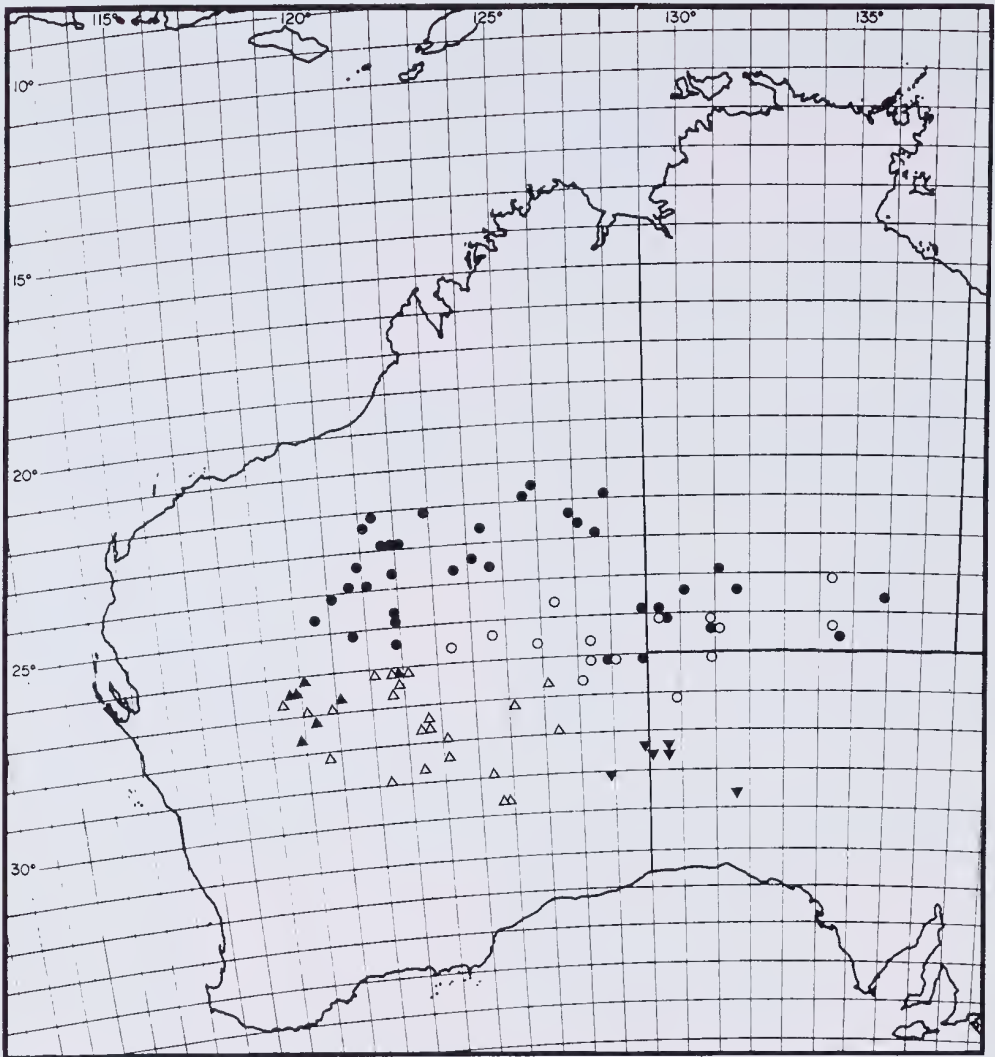


Figure 4. Distribution of the variants of *Aluta maisonneuvei*. Subsp. *auriculata* (known range outlined): typical variant ▼, atypical variant on sand or of unknown habitat △ and atypical variant on breakaways ▲. Subsp. *maisonneuvei*: typical (i.e. large-pitted) variant ● and atypical variant (including immature specimens that could belong to either variant) ○.

*Typus*: near Paraburdoo [precise locality withheld], Western Australia, 7 June 1985, M.E. Trudgen 4920 (*holo*: PERTH 05513987; *iso*: CANB, K, MEL, NSW).

*Shrubs* 0.8–2.6 m high, sometimes spreading wider than the height, up to 3.5 m across, glabrous; leaf-bearing branchlets arising at angles of 25–60 degrees, prominently 4-ridged; leaves densely clustered on the branchlets, antrorse to patent, tending to be slightly incurved towards apex; older stems developing a dark grey bark with small patches or fine strips appearing almost fibrous. *Petioles* up to

1.4 mm long. *Leaf blades* linear in outline, 15–20 x 0.5–1 mm, 4-angled and almost square in cross-section, with all faces about equal in width and the lateral ones perpendicular to the others, either flat or somewhat indented along the middle of each face, acute at apex and with an erect to incurved apical point; glands prominent and widespread, the largest ones either circular and c. 0.1 mm diameter or ellipsoid and almost 0.2 mm long. *Inflorescence* with flowers in 1–4 pairs in a small cluster on each branchlet; peduncles 0.3–0.5 mm long. Bracteoles broadly or very broadly ovate, 2.5–3.5 mm long, acuminate; membranous margins 0.7–1.3 mm wide. *Flowers* 8–10 mm diameter; disc pale green at first. *Sepals* more or less depressed ovate, 1–1.3 mm long; herbaceous portion broadly triangular, green, not reaching apex; membranous margin denticulate, auriculate. *Petals* 5, broadly obovate, c. 3.5 mm long, white, usually denticulate. *Stamens* 15–22, usually rather irregularly arranged, occurring both opposite and alternate to the sepals and petals but tending to be more common opposite the sepals than the petals; filament 1–1.4 mm long, white; anther c. 0.5 mm wide, brownish; gland colour not recorded. *Staminodes* up to 3 often present opposite the petals but very reduced, tooth-like, up to 0.1 mm long. *Ovules* c. 6. *Style* 0.7–0.9 mm long. *Fruit* c. 2.5 mm long but probably not fully mature, the sepal bases pitted-rugose similar to the hypanthium; hypanthium rather prominently but minutely pitted; disc c. 2.7 mm diameter. *Seeds* apparently several per fruit, not seen at maturity. (Figure 5A–F)

*Other specimens examined.* WESTERN AUSTRALIA, near Paraburdoo [precise localities withheld]: 7 June 1985, M.E. Trudgen 4913; 12 June 1985, M.E. Trudgen 4995; 22 Oct. 1985, CK 402; 26 Oct. 1985, M.E. Trudgen 5349, 5350; 26 Oct. 1985, M.E. Trudgen 5351.

*Distribution.* Endemic to the Pilbara region in the Ereman Botanical Province of Western Australia, occurring west and east of Paraburdoo. (Figure 2B)

*Habitat.* Recorded on the edge of creek beds, at the base of cliffs, in cracks on the cliff face, and near the crest of a large ridge.

*Phenology.* Flowers recorded in June. Fruits recorded in late October.

*Conservation status.* CALM Conservation Codes for Western Australian Flora: Priority One. Known from a number of populations extending along a range of hills for a distance of c. 50 km.

*Etymology.* From the Latin *quadratus* – square, in reference to the square shape, in cross-section, of both the leaves and the young stems.

*Notes.* This species has been known by the phrase name *Thryptomene* sp. Mt Channar (M.E. Trudgen 4920). It probably has more primitive features than any other members of the genus, having more numerous stamens and ovules, all other species having 5 or c. 10 stamens and 4 ovules. The anthers also appear to be primitive in that the cells (from inner view) sometimes have a distinct narrow gap between them through which the connective can be seen, the fusion of the cells being only via the connective. In other species the cells appear to be closely united not only to the connective but also to one another.

*Aluta quadrata* can also be readily distinguished by its vegetative morphology. It has larger leaves than the other species and is the only member of the genus to regularly have perpendicular rather than oblique lateral surfaces on the leaves, with all four surfaces about equal in size. *A. maisonneuvei* subsp. *auriculata* also tends to have perpendicular or almost perpendicular surfaces on the leaf, but this taxon has very small leaves.

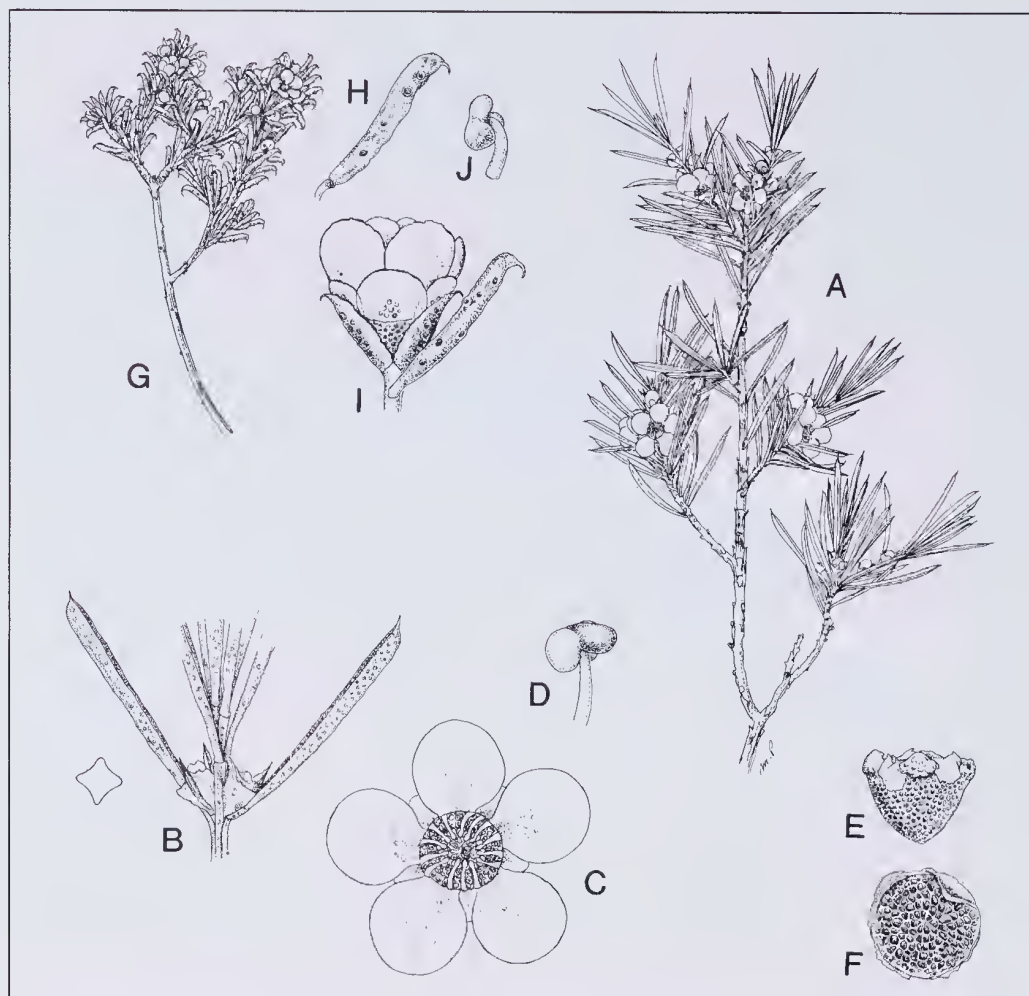


Figure 5. A–F. *Aluta quadrata*. A – flowering branch (x1), B – leaves and axillary flower buds enclosed in bracteoles (x3), with enlarged cross-sectional outline of leaf, C – top view of flower (x4), D – stamen (x20), E – hypanthium and auriculate sepals in fruit (x5), F – disc and sepals in fruit (x5); G–J. *Aluta teres*. G – flowering branch (x1), H – leaf (x5), I – flower with bracteoles and subtending leaf (x5), J – stamen (x20). Drawn from M.E. Trudgen 4920 (A–D), M.E. Trudgen 5349 (E,F) and S. Van Vreeswyk 3138 (G–J).

*Aluta quadrata* occurs outside the range of most of the members in the *Thryptomene* and *Baeckea* groups of genera. The only species occurring in the same region as *A. quadrata* is currently known as *Thryptomene wittweri* J.W. Green and has a scattered distribution over a large part of the arid zone. It occurs on a different habitat, and differs in many characters including its ribbed floral tube and much fewer stamens.

***Aluta teres* Rye & Trudgen, sp. nov.**

Differt a *Aluta aspera* foliis magis teretibus acumine apicali recurvo prominenti.



*Typus*: Bulga Downs Station [precise locality withheld], Western Australia, 16 September 1992, S. Van Vreeswyk 3138 (*holo*: PERTH 04201558; *iso*: CANB).

*Shrub* c. 0.4 m high, erect, glabrous; leaf-bearing branchlets mostly arising at angles of 30–90 degrees, rather short, somewhat 4-ridged; leaves densely clustered on the branchlets, antrorse to patent, distally recurved; older stems developing a dark grey bark with strips mostly firmly attached. *Petioles* up to 0.6 mm long. *Leaf blades* almost linear in outline, 3.5–4.5 x c. 0.6 mm, almost terete but with very prominent bulging glands giving an irregular outline, tapered at apex to a prominent recurved point c. 0.5 mm long; glands mainly in two irregular lateral rows of 3–6, one row on each side of leaf, c. 0.2 mm diameter. *Inflorescence* with flowers in 1–4 pairs in a small subterminal cluster on each branchlet; peduncles c. 0.5 mm long. *Bracteoles* more or less ovate, c. 3 mm long, with a recurved apical point; membranous margins 0.2–0.4 mm wide. *Flowers* 7–8 mm diameter. *Sepals* more or less depressed ovate, c. 1.3 mm long, largely membranous, not or scarcely auriculate; vegetative portion not reaching apex, often pinkish. *Petals* almost circular, c. 3 mm long, probably white or pale pink, entire, slightly crenulate. *Stamens* 9 or 10, a few opposite the sepals and the rest alternating with both sepals and petals; filament c. 0.7 mm long; anther c. 0.3 mm wide, red-brown; gland apparently somewhat paler than anther cells at first. *Staminodes* often a few present in the larger gaps between stamens but very reduced, tooth-like, less than 0.1 mm long. *Ovules* 4. *Fruit* not seen at maturity. (Figure 5G–J)

*Distribution*. Recorded from Bulga Downs Station (south-east of Sandstone) in the Ereman Botanical Province of Western Australia. (Figure 2B).

*Habitat*. Red clayey sand over hard pan on a broad plain with spinifex dominated by *Eucalyptus gongylocarpa*.

*Phenology*. Flowers recorded in September.

*Conservation status*. CALM Conservation Codes for Western Australian Flora: Priority One. This species is known only from the type collection.

*Etymology*. From the Latin *teres* – rounded, cylindrical, in reference to the terete leaves.

*Notes*. The single collection of this species is in bud with a few flowers just opening, so the style is too immature to measure and fruits are unknown, but the characteristic features of the genus are clearly evident. The phrase name *Malleostemon* sp. Bulga Downs (S. Van Vreeswyk 3138) has been applied to it.

*Alutateres* differs from all other members of the genus in its more terete leaves with more protruding oil glands. There is some evidence near the apex of the 4-angled leaf cross-section found in all the other species, but below this the leaf shape is distorted by the bulging oil glands, giving the leaves an irregular outline.

Like its closest relative *A. aspera*, it has c. 10 stamens, and there are no obvious floral differences between the two species. *A. teres* is readily distinguished from *A. aspera* by the prominent recurved points on its leaves and bracteoles as well as by the other leaf characters noted above.

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